

Manitoba



ANNUAL REPORT

1984

Dairy Laboratory
Quality Testing
Summary

85-6129/

FOREWORD

The following report contains the annual summary of test results of the Dairy Laboratory of the Animal Industry Branch, Manitoba Agriculture. The Laboratory is located at the Agricultural Services Complex, University of Manitoba, Winnipeg.

Samples analysed at the laboratory continue to provide information on dairy products and milk samples for quality control, health requirements, payment to producers, milk recording information and extension activities within the dairy industry. The analyses performed to provide this information cover a variety of test procedures. The 1984 data is summarized in the tables included in this report.

Tests performed on raw milk bulk tank samples include: fat, protein, lactose, antibiotics, added water and somatic cell counts. In addition fat, protein and lactose determinations are made for the D.H.I.A. and Owner Sampler programs. Pasteurized products are tested by Standard Plate Count, Coliform count, phosphatase test, added water in homogenized, 2%, and skim milk and keeping quality tests on pasteurized milk. Butter samples are monitored for yeasts, moulds, and proteolytic bacteria. Cheddar cheese samples are tested for coliform bacteria, E. coli, Staphylococcus aureus and Salmonella.

Due to the integration of the D.H.I.A. program into Central testing and the significant growth in this program, a considerable increase in work load was experienced in the milk composition unit of the Dairy Laboratory. This integration was completed in 1980. To handle this additional sample load a second MilkoScan 203 was put in line. Information on Butterfat-protein inversions continues to be available to extension personnel as an aid in correcting the problems of feeding and herd management.

All tests for payment purposes for the Manitoba Milk Producers' Marketing Board continue to be done weekly by the MilkoScan 203, on fresh milk samples. These weekly test results are transmitted to the Marketing Board via computer interchange, with the butterfat results used to determine the value of milk shipments based on a butterfat differential. Protein and lactose results continue to be entered in the computer storage tape for possible future use.

Two Hewlett Packard 85 instrument controllers have now been interfaced with both MilkoScan 203's. This has practically eliminated the manual transfer of data. All producer test data from the Milkoscan continue to be automatically recorded on tape and then transferred to the Milk Marketing Board Computer via telephone line.

LABORATORY STAFF

D.M. Macaulay, BSA., MSc.....Dairy Laboratory Specialist
Lynne Macaulay.....Supervisor, Milk Composition Lab.
On Chan, BSc.....Supervisor, Microbiology Lab.
Betty Kupskey, BSc, MSc.....Technician
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Tannis Paton, BSc.....Technician
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Joseph Chau, BSc.....Technician

DAIRY LABORATORY FUNCTIONS

The Dairy Laboratory is a central testing facility within the Dairy Section of the Animal Industry Branch, Manitoba Agriculture.

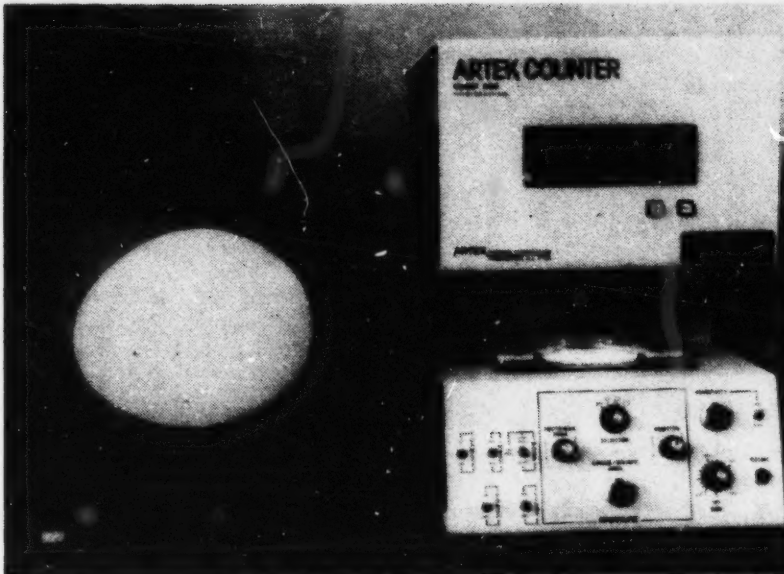
The basic functions of the laboratory are:

- 1) Testing of raw milk to insure that it meets the quality requirements as outlined in the Dairy Act.
- 2) Testing of pasteurized dairy products to insure that all safeguards are met and to provide information on keeping quality estimation.
- 3) Testing of pasteurized dairy products to insure that all composition parameters are maintained.
- 4) Testing for butterfat and other components as a basis of payment to milk producers.
- 5) Milk Composition testing for Dairy Herd Improvement Association and Owner Sampler Milk Recording programs.
- 6) Assistance to field staff and industry in solving quality problems.

SAMPLING

- 1) The procedure in use for raw milk, involves the aseptic collection of a universal milk sample that can be used for both bacteriological and compositional analysis. Each milk shipper is supplied with sterile "whirl pak" plastic bags, identified with his name and number. These bags are used for representative sampling by the Bulk Milk Grader at each Bulk Milk pick-up. The milk samples so collected are stored in an ice water container on the truck and then transferred to a refrigerated storage at the dairy plant prior to delivery to the laboratory. All samples are delivered to the dairy laboratory within 48 hours of pick-up and must arrive at a temperature below 5°C.
- 2) Sampling and testing of all pasteurized fluid products is done not less than once per week. The products include cottage cheese, sour cream, cream cheese spread, as well as fluid milk products. Butter and cheddar cheese samples for bacteriological examination are taken not less than once per month from all manufacturing plants in the province.

RAW MILK QUALITY



ARTEK AUTOMATIC COLONY COUNTER

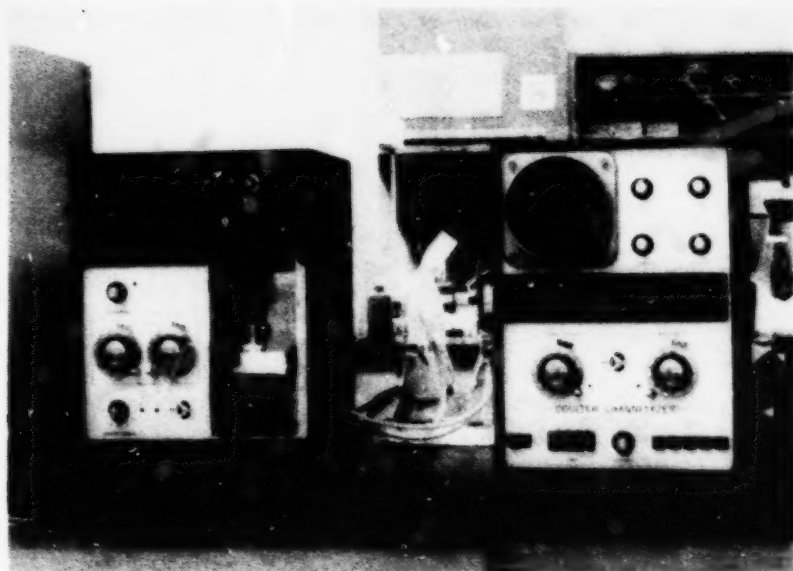
Used for counting of
Standard Plate Counts and
Plate Loop Counts on raw
and pasteurized milk
samples.

Plate loop counts are done for each milk producer once per month to insure that bacteriological standard for acceptable milk of "not more than 75,000 per ml" is maintained. It is generally agreed that if milk has been produced and handled properly there should be no difficulty in maintaining a bacteria count of less than 75,000 per ml. In fact, over 87% of the producer samples have counts of less than 50,000 (Table 1). Since most of the bacteria present in raw milk produce enzymes capable of producing defects in the pasteurized product their numbers should be low to insure that the final product is of good quality.

TABLE 1
RAW MILK QUALITY - 1964
PLATE LOOP COUNTS
(counts per ml)

Month	Producer Samples	<50,000	Percent <50,000	50,000 to 75,000	Percent 50-75,000	<75,000	Percent <75,000	>75,000	Percent >75,000	Plate Loop Samples
January	1170	1034	87.7	95	8.1	1129	95.8	41	3.5	1524
February	1185	1046	88.2	93	7.8	1139	96.1	46	3.9	1520
March	1174	1043	88.6	91	7.7	1134	96.3	40	3.4	1400
April	1182	1015	85.7	129	10.9	1144	96.7	38	3.2	1564
May	1176	1052	89.4	95	8.1	1147	97.5	29	2.5	1457
June	1157	1026	88.3	96	8.3	1122	96.6	35	3.0	1496
July	1154	987	85.5	106	9.2	1093	94.7	61	5.3	1488
August	1169	951	81.3	156	13.3	1107	94.6	62	5.3	1520
September	1221	1103	90.3	101	8.3	1204	98.6	17	1.4	1493
October	1163	1047	88.1	88	7.4	1135	95.5	28	2.4	1492
November	1152	1042	90.1	75	6.4	1117	96.9	35	3.0	1365
December	1160	1032	88.7	105	9.0	1137	97.7	23	1.2	1398
YEARLY TOTAL	14,063	12,378	87.7	1,230	8.7	13,608	96.4	455	3.2	17,991

SOMATIC CELL COUNTS



COULTER COUNTER AND COULTER CHANNELYZER

The Coulter Counter is used electronically counting somatic cells in milk. Coulter Channelyzer is used to determine the range of Somatic Cell sizes in the milk sample.

Somatic cell counts are done on all milk producer samples each month. Cell numbers are reported on a per millilitre basis and include all types of cells present in the milk. The presence of mastitis infection is the principle factor in causing an elevated cell count. However, temporary high cell counts may be due to such factors as: mechanical injury to the cow, stage of lactation, or other "stress" factors. Research in this area indicates that herd cell counts over 500,000 results in altered milk composition, flavour defects, decreased milk production in the herd, and lower yields for the cheese industry.

The Farm Services staff are available to provide special assistance to milk producers, that encounter a consistently high cell count. One important first step is to analyze the milking equipment and milking methods. After recommended corrections have been made the herd may be quarter sampled and these samples used to determine which quarters in the herd are causing the problem. The producer will then in consultation with his Veterinarian determine the action to be taken to correct the problem.

TABLE 2
SOMATIC CELL COUNTS - 1984
(counts per ml)
(m = million)

Month	Producers Tested	<500,000	%	500 to 1m	%	1m to 1.4m	%	1.5m to >	%
January	474	264	56.7	163	34.4	39	8.2	8	1.7
February	659	396	60.1	208	31.6	37	5.6	18	2.7
March	552	317	57.4	187	33.9	39	7.1	9	1.6
April	672	411	61.2	216	32.1	38	5.7	7	1.0
May	482	258	53.5	180	37.3	37	7.7	7	1.5
June	1178	674	57.2	429	36.4	64	5.4	11	.93
July	1132	469	41.4	542	47.9	99	8.7	22	1.9
August	1162	344	29.6	614	52.8	159	13.7	45	3.9
September	1153	575	49.9	464	40.2	97	8.4	17	1.5
October	1173	658	56.1	417	35.5	79	6.7	20	1.7
November	1153	635	55.1	404	35.0	85	7.4	29	2.5
December	1150	607	52.8	410	35.6	101	8.8	32	2.8
TOTAL	10940	5608	51.7	4234	38.7	874	7.9	225	2.1

	1983	1984
<500,000	49.6%	51.3%
500,000 to 1m	39.6%	38.7%
1.0 to 1.4m	8.0%	7.9%
1.5m or more	2.7%	2.1%

TABLE 3

**MEAN CELL. COUNTS ON
HERD BULK MILK - COULTER COUNTER**
(counts per ml)

Month	1979	1980	1981	1982	1983	1984
January	684,000	738,000	744,000	544,000	572,000	540,000
February	600,000	720,000	814,000	579,000	532,000	519,000
March	647,000	744,000	696,000	625,000	477,000	540,000
April	622,000	781,000	629,000	542,000	550,000	539,000
May	600,000	805,000	612,000	688,000	503,000	536,000
June	660,000	750,000	626,000	620,000	522,000	524,000
July	724,000	840,000	622,000	625,000	632,000	610,000
August	842,000	970,000	561,000	718,000	700,000	710,000
September	899,000	828,000	571,000	658,000	641,000	580,000
October	777,000	757,000	520,000	689,000	691,000	562,000
November	811,000	735,000	510,000	634,000	618,000	556,000
December	<u>766,000</u>	<u>718,000</u>	<u>540,000</u>	<u>594,000</u>	<u>638,000</u>	<u>570,000</u>
AVERAGE	748,000	778,000	629,000	625,000	576,000	566,000

ANTIBIOTIC TESTING PROGRAM

In all milk markets the presence of detectable amounts of antibiotics in the milk supply is of concern for two reasons: (1) presence of many types of antibiotics in milk, may cause an allergic reaction in persons who are sensitive to them; (2) the presence of small amounts of antibiotics slows or stops the growth of the bacterial culture used in the milk for cultured products and cheese, resulting in loss of production and "dumping" of the milk

The Dairy Laboratory monitors all shipper samples once per month using Bacillus subtilis disc assay, 1/2" disc, in addition all tank truck samples are screened using Bacillus stearothermophilus 1/2" disc assay on PMI agar. When a shipper sample is found to be "positive" for antibiotics, the producer, farm services inspector and hauler are notified for corrective action. As a result the producer receives a penalty deduction from the Milk Marketing Board. Also, shipments from the producer cannot be resumed until a negative test is obtained.

TABLE 4

ANTIBIOTIC TESTING PROGRAM - 1984

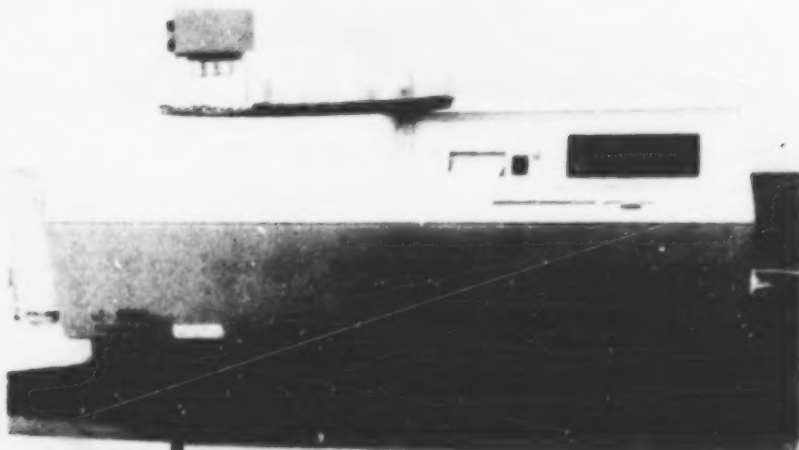
Month	Producers Tested	Total Tests Done	Producers Positive	Percent of Producers in Penalty
January	1179	1806	3	.25
February	1179	2046	3	.25
March	1177	1931	4	.34
April	1183	1959	3	.25
May	1177	1852	3	.25
June	1179	1959	1	.08
July	1180	1840	5	.42
August	1182	2053	7	.59
September	1178	1892	3	.25
October	1188	1906	3	.25
November	1187	1853	6	.51
December	<u>1166</u>	<u>1791</u>	<u>4</u>	<u>.34</u>
	14155	21888	45	

For the year there were .32% of the milk producers with positive antibiotics.
.21% of all samples tested were positive for antibiotics.

ADDED WATER TESTING PROGRAM

4C11 CRYOSCOPE

For detection of added water in milk. Operates automatically including printouts of freezing points.



All milk producer and truck samples are monitored at least once per month. When a reading of -0.524°C or higher is obtained it is considered to be adulterated. The Marketing Board is notified and the producer is given a warning that any other violation in a twelve month period results in a cash penalty to the producer.

TABLE 5

CRYOSCOPE: - RAW MILK - 1984

Month	Producer Samples	-0.524° or Higher	Percent	Normal	Percent	Truck Samples	-0.524° or Higher	Percent	Total Cryoscopes
Jan.	1201	3	.25	1198	99.7	129	0	0	1455
Feb.	1220	8	.70	1212	99.3	121	0	0	1444
March	1234	2	.16	1230	99.7	132	0	0	1589
April	1210	10	.83	1194	98.7	141	0	0	1458
May	1250	1	.08	1249	99.9	141	0	0	1502
June	1193	3	.25	1186	99.4	120	0	0	1430
July	1174	6	.51	1166	99.3	118	0	0	1435
August	1209	3	.26	1206	99.8	121	0	0	1456
Sept.	1248	6	.50	1237	99.1	131	0	0	1469
Oct.	1158	5	.43	1151	99.4	122	0	0	1280
Nov.	1187	6	.51	1181	99.5	119	0	0	1445
Dec.	1167	8	.69	1159	99.3	127	0	0	1389
TOTAL	14451	61	.42	14369	99.4	1522	0	0	17352

FINISHED PRODUCT TESTING

Bacteriological standards for processed and manufactured dairy products are set out by Regulation. These include Standard Plate Counts and Coliform counts on fluid milk products, Coliform and Staphylococcus, and Salmonella Counts on cheddar and speciality cheese products. Butter is tested for yeast and mould counts and proteolytic bacteria counts.

The standard for non-cultured fluid milk products is "not more than 10 Coliforms per ml. The standard for butter is "not more than 10 yeast and moulds per gram". Products exceeding the standards are retested and if found to exceed the standard, the product is subject to recall from the market.

Testing for various bacteria in pasteurized dairy products is done to determine potential sanitary problems at the dairy plant. High bacteria counts in the packaged product is largely due to post pasteurization contamination. In addition, all pasteurized dairy products are tested for adequate pasteurization by the use of the phosphatase test. Products which have not been heated to pasteurization temperature for sufficient time, or have been contaminated with small amounts of raw milk, will fail the test. If a product gives a positive test it is subject to immediate recall from the market.

The Standard Plate Count and Coliform count are used as a measure on pasteurized fluid products of the sanitary handling of the milk at the dairy plant. The types of bacteria found in pasteurized milk are predominately spoilage organisms and usually cause flavor defects. When there is a low bacteria count in the pasteurized milk usually it has a longer storage life and improved flavor and quality.

TABLE 6
FINISHED PRODUCT QUALITY - 1984

Product	Coliform Counts Number of Tests	10/ml	% > 10/ml	Standard Plate Count Number of Tests	20,000/ml	% > 20,000/ml
Homo	527	3	.57	525	3	.57
Low Fat Homo	458	2	.43	455	3	.66
Cereal Cream	377	3	1.0	375	5	1.3
Whipping Cream	257	1	.39	257	5	1.9
Chocolate Drink	246	7	2.8	245	3	1.2
Skim Milk	415	4	.96	412	0	0
Ice Cream	198	14	7.1	194	5	2.6
Ice Cream Mix	199	5	2.5	198	3	1.5
Cottage Cheese	119	1	.84			
Buttermilk	99	2	2.0			
Salad Cream	229	5	2.2			
TOTAL	3124	47	1.5	2661	27	1.0

KEEPING QUALITY TESTS

This program was continued in 1984 with 180 Homogenized Milk and 215 Low Fat 2% samples tested.

Many flavor defects in pasteurized products are due to bacterial growth during storage. Routine bacteria counts are done on freshly pasteurized product picked up at the Dairy Plant and are very low (less than 300 per ml), however, the maximum standard is 20,000/ml. These same samples, when held for 5 days at 7°C and then tested, may still have a low count or may have increased to 250,000 per ml or more. The bacteria count after storage is from bacteria which can grow at low temperatures and is indicative of the degree of contamination of the pasteurized product by psychrotrophic bacteria. If a processing plant produces low counts after storage (5 days at 7°C), shelf life and flavor quality is likely to be improved. The basis of the test is to detect potential spoilage bacteria which will shorten the shelf life of the pasteurized product. Note Table 7, 1.6% of the fresh samples tested were over 20,000 standard plate counts while 36.5 of samples tested after storage for 5 days at 7°C had counts of over 250,000 per ml.

CRYSCOPE ON PASTEURIZED PRODUCTS

Under the Dairy Act, milk is considered adulterated if by test it is determined that there is "added water" in the product. The degree of adulteration is determined by measuring the freezing point of the milk, similar to the test used on raw milk. A freezing point of -0.524 degrees or higher is considered to be adulterated and such products are subject to recall. Pasteurized products regularly tested are Homogenized Milk, 2% Homo and Skim Milk.

TABLE 7
KEEPING QUALITY TESTS 1984
 (5 days @ 7°C then SPC)

<u>PRODUCT</u>	<u>TOTAL</u>	<u><50,000/ML</u>	<u>51-100,000/ML</u>	<u>101-250,000/ML</u>	<u>>250,000/ML</u>
Homo	180	100 (55.5%)	8 (4.4%)	7 (3.9%)	65 (36.1%)
Low Fat Homo	215	94 (43.7%)	10 (4.6%)	8 (3.7%)	85 (39.5%)

Initial counts on all samples were less than 20,000 except for 1 sample of 2% milk.

PHOSPHATASE TESTING

Products Tested: Homo, 2%, Skim, Cereal Cream, Whipping Cream, Ice Cream Mix, and Cottage Cheese

Total Number of Tests: 2367 All phosphatase tests less than 2.3 units.

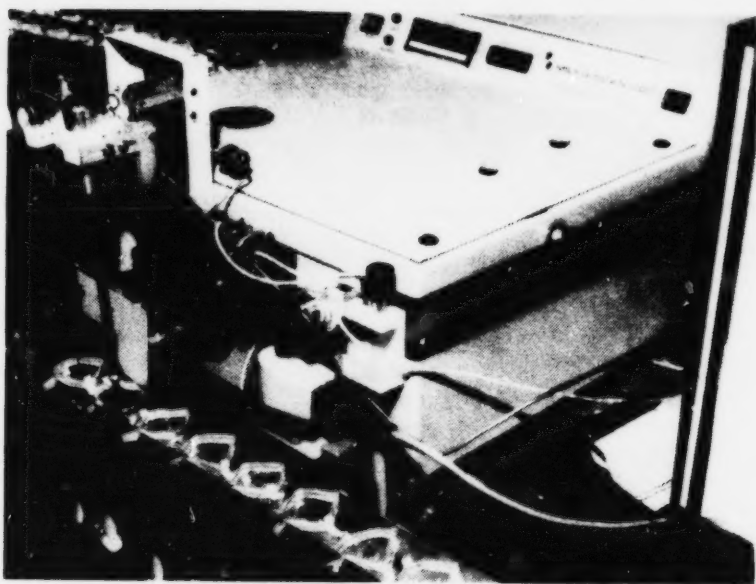
The phosphatase test is used to determine if a product has been properly pasteurized or if the pasteurized product has been recontaminated with raw product. The test measures residual phenol in the sample. Raw milk gives a high phenol reading while a pasteurized sample will give values of less than 2 ug of phenol equivalent per 0.5 ml of fluid dairy product; or for cheese, a reading of less than 2 ug of phenol equivalent per 0.25 gm. Results showing more than 2 ug are reported as positive phosphatase.

TABLE 8

CRYOSCOPE - PASTEURIZED MILK - 1984

<u>Month</u>	<u>Total</u>	<u>Freezing Point -0.524° or Higher</u>	<u>Percent -0.524° or Higher</u>
January	125	1	.81
February	103	1	.97
March	203	0	0
April	118	4	3.4
May	109	1	.92
June	117	0	0
July	135	2	1.5
August	126	1	.80
September	89	1	1.1
October	108	3	2.8
November	106	2	1.9
December	<u>89</u>	<u>1</u>	<u>1.1</u>
TOTAL	1428	17	1.2

MILK COMPOSITION



MILKO SCAN 203

Tests for fat, protein and lactose by infrared. This equipment can test up to 220 samples per hour.

Butterfat, protein and lactose is determined on raw milk samples for the Dairy Herd Improvement Association, Owner Sampler programs and the Manitoba Milk Producers' Marketing Board. The Manitoba Milk Producers' Marketing Board use the butterfat tests as a basis of payment with protein and lactose results being stored for future use. Table 12 gives a summary of the average monthly fat tests for 1983 and 1984. The average protein tests are included for the same period. Table 13 gives average lactose comparisons for 1983 and 1984.

Butterfat testing of pasteurized dairy products is done to determine if each product meets the legal standard for butterfat. The minimum butterfat content for each product is stated on the container. Dairy products are subject to recall by the dairy plant if three consecutive tests are outside the acceptable limit.



Hewlett Packard 85
Controller

TABLE 9

TESTS PERFORMED IN MILK COMPOSITION LAB FOR THE YEAR 1984

Month	Butterfat on Farm Tank Samples	Butterfat on		Total Proteins, Fats & Lactose
		DHIA	Q/S	
January	5938	9779	3488	19205
February	4439	9192	3349	16980
March	5335	9596	3102	18033
April	4115	8929	2468	15512
May	6184	10161	3610	19955
June	5594	8735	3762	18091
July	5875	8420	2404	16699
August	4929	8703	2503	16135
September	5246	8985	3321	17552
October	6395	10822	3396	20613
November	4662	9374	3297	17333
December	<u>3973</u>	<u>7632</u>	<u>1832</u>	<u>13437</u>
TOTAL	62685	110328	36532	209545

In addition to the regular compositional tests on Producer and DHIA samples, samples were also tested for the University of Manitoba Animal Science Department, Calibration Samples, Specials for commercial dairies and Farm Services, and inter-laboratory comparisons as follows:

January	1228
February	1862
March	1549
April	968
May	1639
June	1220
July	976
August	1110
September	1089
October	1068
November	1269
December	<u>848</u>
TOTAL	14826

Split samples were prepared and tested by the AOAC Mojonnier method and on both Milko Scan 203 machines. The numbers were as follows:

January	285
February	148
March	165
April	136
May	176
June	168
July	168
August	152
September	152
October	176
November	176
December	<u>112</u>
TOTAL	2014

TABLE 10

BUTTERFAT TESTS ON FINISHED PRODUCTS

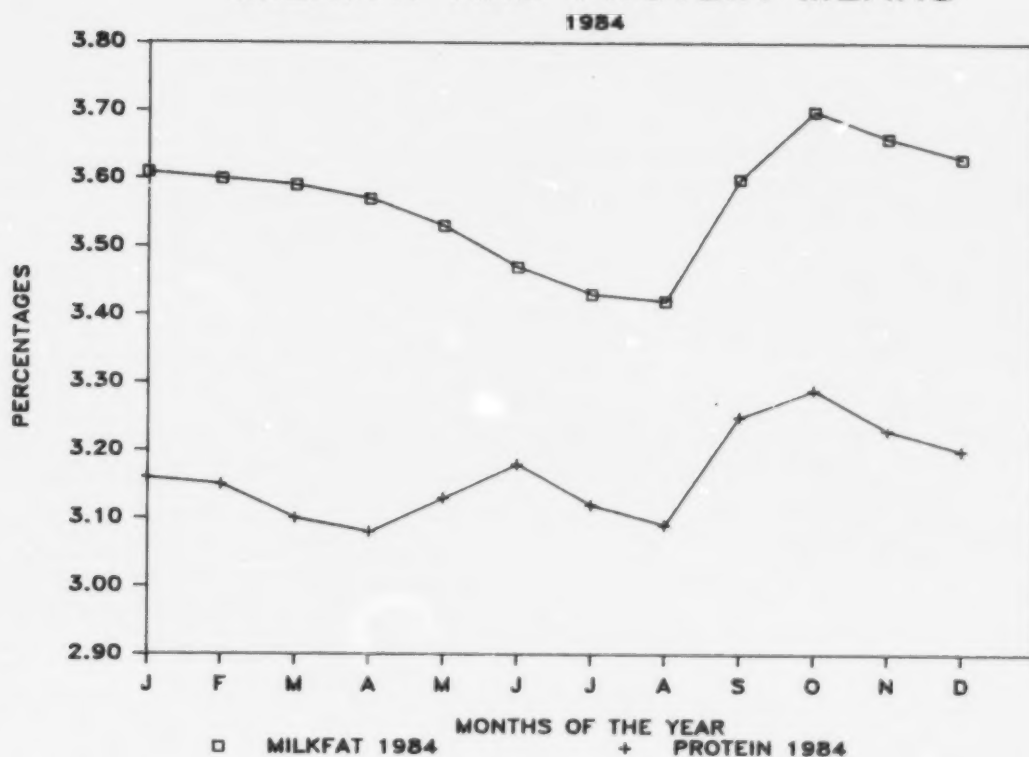
<u>Month</u>	<u>Total Tests</u>	<u>Percent Outside Standard</u>	<u>Outside Standard</u>
January	209	20	9.6
February	246	22	8.9
March	250	30	12.0
April	223	13	5.8
May	233	22	9.4
June	231	21	9.1
July	196	28	14.2
August	254	31	12.2
September	190	16	8.4
October	245	11	4.5
November	249	25	10.0
December	<u>172</u>	<u>15</u>	<u>8.7</u>
TOTAL	2698	254	9.4

TABLE 11

TOTAL COUNT ON RAW MILK HELD AT MANITOBA PROCESSING PLANTS

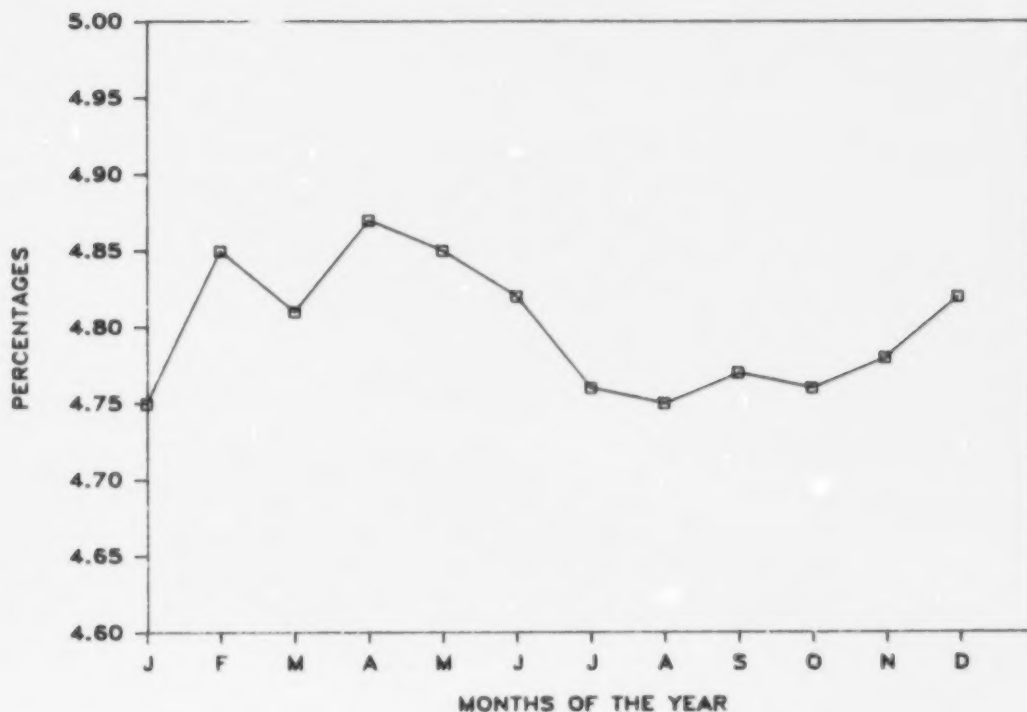
Month	1983 <u>Samples Tested</u>	% <u>>300,000</u>	1984 <u>Samples Tested</u>	% <u>>300,000</u>
January	38	36.8	61	32.7
February	42	16.7	58	36.2
March	49	34.7	58	32.7
April	40	27.5	56	30.3
May	41	51.2	42	23.8
June	40	52.2	44	27.2
July	28	35.7	37	18.9
August	12	33.3	39	35.9
September	24	12.5	34	17.6
October	26	19.2	44	11.4
November	55	21.8	40	20.0
December	<u>34</u>	<u>32.4</u>	<u>29</u>	<u>20.6</u>
TOTAL	429	AVERAGE 34.0%	TOTAL 542	AVERAGE 26.8

MILKFAT AND PROTEIN MEANS



	1983		1984	
	B.F.	Protein	B.F.	Protein
Jan.	3.57	3.16	3.61	3.16
Feb.	3.57	3.17	3.60	3.15
Mar.	3.56	3.14	3.59	3.10
Apr.	3.58	3.09	3.57	3.08
May	3.59	3.13	3.53	3.13
June	3.47	3.17	3.47	3.18
July	3.46	3.05	3.43	3.12
Aug.	3.40	3.09	3.42	3.09
Sept.	3.58	3.24	3.60	3.25
Oct.	3.73	3.30	3.70	3.29
Nov.	3.72	3.26	3.66	3.23
Dec.	3.68	3.23	3.63	3.20

LACTOSE MEANS 1984



	1983	1984
Jan.	4.83	4.75
Feb.	4.85	4.85
Mar.	4.87	4.81
Apr.	4.88	4.87
May	4.90	4.85
June	4.81	4.82
July	4.76	4.76
Aug.	4.70	4.75
Sept.	4.76	4.77
Oct.	4.76	4.76
Nov.	4.75	4.78
Dec.	4.74	4.82